Example

beginning from the matrix:

$$A = \begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & 3 \\ 2 & 1 & 4 \end{pmatrix}$$

let us find the inverse matrix A^{-1} by using **Gauss-Jordan method**

$$A = \begin{pmatrix} 1 & 2 & 1 & 1 & 0 & 0 \\ 0 & 1 & 3 & 0 & 1 & 0 \\ 2 & 1 & 4 & 0 & 0 & 1 \end{pmatrix}$$

To make the constant in the third row and the first column equal zero, $a_{31} = 0$, we start from the third row and subtract from the first row multiply by 2, mathematically:

$$R_3 \to R_3 - 2R_1$$

the new matrix we obtain becomes:

$$A = \begin{pmatrix} 1 & 2 & 1 & 1 & 0 & 0 \\ 0 & 1 & 3 & 0 & 1 & 0 \\ 0 & -3 & 2 & -2 & 0 & 1 \end{pmatrix}$$

in the second column we find the pivot is 1, we set the numbers above and below it to zero, the matrix becomes:

$$A = \begin{pmatrix} 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 3 & 0 & 1 & 0 \\ 0 & 0 & 2 & -2 & 0 & 1 \end{pmatrix}$$

when we move on to the third row, specifically a_{33}, we find that the pivot is 2, by dividing by 2 we obtain the new matrix with the pivot 1 in a_{33}

$$A = \begin{pmatrix} 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 3 & 0 & 1 & 0 \\ 0 & 0 & 1 & -1 & 0 & \frac{1}{2} \end{pmatrix}$$

Thus, we obtain the new matrix after we set the numbers above the pivot to zero:

$$A = \begin{pmatrix} 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & -1 & 0 & \frac{1}{2} \end{pmatrix}$$

therefore, the inverse matrix we obtained it using **Gauss-Jordan** method is:

$$A^{-1} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -1 & 0 & \frac{1}{2} \end{pmatrix}$$